

B⁴ Claim 12 (amended) The vacuum holding device (1) according to claim 10 wherein the extension of the valve (9) is elastic to hold the valve in the bearing surface.

REMARKS

Reconsideration of this application is requested in view of the amendments to the claims and the remarks presented herein.

The claims in the application are claims 1 to 14, no other claims having been presented.

The Information Disclosure Statement together with PTO Form 1449 was filed on April 24, 2002 as can be seen from the copy of the return receipt card filed herewith. If the Patent Office has lost the same, please inform the undersigned and he will provide additional copies.

All the claims are rejected under 35 USC 112, second paragraph, as failing to properly define the invention for the reasons set forth in paragraphs (i) to (xi).

Applicant respectfully traverses these grounds of rejection since the amended claims are believed to properly define the invention. Proper antecedent basis has now been provided for the various terms and with respect to claims 13 and 14 lacking antecedent basis, this is an incorrect statement since the seal (15) is recited in both claims

1 and 10 upon which they are defended. Markush terminology has been used where appropriate and the term “preferably” has been deleted from the claims and there is only one period in claim 1. Therefore, the amended claims are believed to comply with 35 USC 112 and withdrawal of these grounds of rejection is requested.

Claims 1 to 3, 5, 7 and 8 were rejected under 35 USC 102 as being anticipated by the Hansen et al patent and the remaining claims were rejected under 35 USC 103 as being obvious over Hansen taken in view of the Arai patent or the French reference. The Examiner states that Hansen discloses a vacuum holding device comprising a vacuum holding device which is detachable from a vacuum source, a vacuum chamber (26), a valve (42), a means for detaching a vacuum (18 and 16 around element 56), an external vacuum chamber (24 and 20) and deems that the remaining claims would be obvious from the secondary references.

Applicant respectfully traverses these grounds of rejection since the Hansen reference taken alone, or in view of the secondary art, does not anticipate or render obvious Applicant's invention. The Hansen patent relates to a venturi head for a vacuum system such as a suction cup and the body 10 of the venturi head is comprised of two portions 12 and 14. Body portion 12 is a venturi section having a venturi gross passage originating at an inlet 16 and terminating at an exhaust port 18 with a venturi restriction nozzle 20 and interposed centrally therebetween in passage 22. A source of pressure delivers pressurized air to inlet 16.

A working passage 24 extends transversely of the venturi passage to a vacuum cup outlet 26 into which is threaded a nipple tube 28 supporting a vacuum cup 30. The working passage 24 of the body portions has a section 40 enlarged to receive a ball check 42 which acts on a ball seat 44 to provide unidirectional flow away from the vacuum cup outlet. A spring 46 seated against shoulder 48 acts on this ball check. A release passage is also provided at 50 intersecting the vacuum cup outlet passage between the cup mount and the ball check 42. This passage is of no interest as it does not correspond to any of the embodiments of Applicant's invention.

Actuations of valve 62, with valve 64 closed, will direct air to the venturi nozzle which exhausts at outlet 18. When the vacuum cup 30 is seated off by application against a surface, the air will be exhausted from passage 24 to the point that atmospheric pressure in the cup chamber will open ball check valve 42 against spring 46 and permit a low pressure condition above and below the ball check valve 42. When the spring pressure is overcome and the ball 42 lifts off the seat 44, the pressure will equalize on either side of the ball and the spring will return the ball to the valve seat. During this holding cycle, the spring 58 is holding the ball 56 against the seat 54 resisting atmospheric pressure which tends to open the valve. When the holding cycle is to be interrupted, valve 64 is operated to direct pressure to chamber 52 which will open valve check 56 and pressurize the vacuum passage 26 in the cup chamber, thus effecting release of the cup from a closing surface.

The deficiencies of the Hansen patent are not overcome by the secondary references. The Arai patent discloses a sucker for lifting sheets of plate glass, which sucker has a sucker body defining the suction hole at a suction surface of the body. The sucker body carries a manual vacuum pump, a sensor for detecting the degree of vacuum and a sound generator which is turned on when the sensor detects a loss of vacuum of a predetermined degree. Sensor and sound generator do not need to be explained, as such features have no relation whatsoever to Applicant's invention.

In Arai, a manual vacuum pump 6 (see fig. 4), which also serves as a grip, extends between the support plates 4 and 5 on top of the surface of the sucker body. The manual vacuum pump 6 comprises a cylinder 11 extending between the support plates 4 and 5, a head 12 secured to one end of the cylinder 11, a control member 13 inserted into the cylinder 11 from the other end, a piston 14 having a rod 15 coupled to the control member 13 and a spring 17 bearing on a portioning wall 16 in a compressed state. The piston 14 is normally biased by the spring 17 toward the retracted position.

The piston 14 is adapted to allow compressed air to escape rearward when it is moving forward while being pushed by the control member 13 and to create a vacuum when moving rearward biased by the spring 17. The head 12 is provided with a passage 19 axially extending therethrough and a suction channel 23 communicating with passage 19. A check valve 21 is provided on an end face of the head 12 which faces the interior of the cylinder 11 and to which the passage 19 opens.

In Fig. 4 of Arai, the check valve 21 has the form of a rubber plate but it is mentioned that the rubber plate may be replaced by a ball-and-spring structure which is not comparable with the valve of Applicant's invention. By reciprocating the piston 14, a vacuum is produced in the cylinder 11 so that the air in the suction recess 3 is drawn out through the check valve 21. As a result, the suction surface 2 of the sucker body 1 is stuck to the pate glass. The higher the degree of vacuum, the shorter the length of retraction of the piston 14. Therefore, the control member 13 is gradually pushed into the cylinder 11 so that the suction force increases. To break the sucking state, the control piece 23 is pushed in to bring the passage 19 into communication with the atmosphere. Therefore, the combination of the prior art does not suggest Applicant's invention.

Applicant considers the Dubos et al reference the closest prior art but this does not anticipate or render obvious Applicant's invention and the present claim 1 clearly differentiates from the cited reference. The suction device of the French reference concerns a venom pump consisting of a vacuum pump 10 and a suction cup 12 wherein the suction orifice 18 of the pump 10 is provided with a normally closed shutter 48 which opens upon introducing the connection 58 of the external chamber 12 and the piston is lockable in its working position, thereby enabling establishment of a depression within the internal space 46 of the pump and thereafter to set said space in communication with the external chamber 12. A venom pump will only apply very moderate vacuum to the skin and cannot be compared to the holding device of Applicant's invention which provides a strong and sudden vacuum.

It is clear from the above that in a venturi pump as taught in the Hasen reference, in a reciprocating pump as taught by the Arai patent and in the French patent, a simple

one stroke pump is used to produce a vacuum. A reciprocating cylinder pump generates a vacuum by compressing air that is released along a sealant around the upper end of the piston during the compression stroke to allow a vacuum to be generated when the piston is pulled into the upper end of the cylinder that bears an upper opening outside the piston pathway (the piston head of the Arai patent and the French reference will never pass that opening).

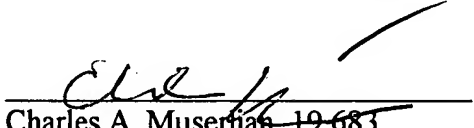
Applicants' invention comprises a suction cup and a detachable piston suction pipe (not a pump as taught by the Hansen patent) with an opening at the end of the suction path to allow as much ambient air as possible to stream into the pipe in one stroke with a loud "pop" when the opening is passed by the piston head. Thereby, the inside of the suction pipe immediately reaches atmospheric pressure and valve 9 is pressed into its peak to tightly seal the vacuum inside from the outside pressure wherein outside pressure equals inside of the suction pipe. The suction pipe may thereafter be removed or, alternatively, attached again to provide a stronger vacuum with a second stroke usually not required.

In contrast, the suction device of the French reference works completely differently. A predefined vacuum is generated by a vacuum pump first (see recesses 96 and 98 in the piston rod 24 for interlocking with the upper orifice 22) and the vacuum pump is attached to the suction cup after the vacuum was generated and not before or during. The French reference, moreover, does not disclose the seal 15 of Applicant's invention since no seal is needed when the cup is placed on the skin because a seal may cause a hematoma.

Claim 10 of the present application is directed to the suction cup itself without the suction pipe and is differentiated from the prior art discussed above by defining the form of valve 9 and it is important that when the sudden vacuum is applied, valve 9 is not lifted too far away from the seat (8) and safely rests on seat (8) when the sudden outside pressure is applied. Therefore, Hansen alone, or in combination of the prior art, does not teach Applicant's invention and withdrawal of this ground of rejection is requested.

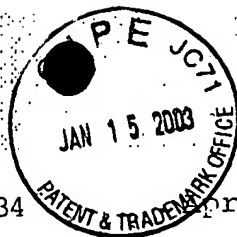
In view of the amendments to the claims and the above remarks, it is believed that the claims clearly point out Applicant's patentable contribution and favorable reconsideration of the application is requested.

Respectfully submitted,
Bierman, Muserlian and Lucas


Charles A. Muserlian, 19,683
Attorney for Applicants
Tel. # (212) 661-8000

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Enclosures: Copy of Return Receipt Postcard dated April 24, 2002
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In re Application of: HARALD RISTAU
Serial No.: PCT No.: PCT/DE00/02362
Filed: March 14, 2002
For: VACUUM HOLDING DEVICE

Received: Information Disclosure Statement (1 pg)
PTO Form-1449 (2 pgs)
Copy of search report
Copies of cited references



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MARKED-UP VERSION OF CLAIMS

Claim 1 (amended) A vacuum holding device (1) with apparatus for producing a vacuum, wherein

- the vacuum holding device (1) and the apparatus for producing a vacuum are constructed in two parts and can be detached and connected substantially gastight by positioning,

wherein the vacuum holding device has:

- a vacuum chamber (5) which is open in the direction of a contact surface (14),
- an opening as the end of a connection from the vacuum chamber to [the] an external environment (7),
- a valve (9) which ensures gastight closing and opening of the connection between the vacuum chamber (5) and the external environment (7)
- means for producing a detachable substantially gastight coupling between [the] an outwardly directed opening and a device to produce a vacuum[.],

[characterized in that]

- the vacuum holding device (1) [has] comprises a seal (15) which seals the vacuum chamber gastight against the contact surface (14) towards the outside, [and] wherein the apparatus for producing a vacuum [has] comprises

- a piston suction pipe (13) which has an opening[s] at the beginning (24) [and at the end] of the suction path (26) with suction piston (28) and wherein
- at the end of the suction path (26) and opening (26) passable by the piston (28) is provided so that when the opening is passed in one go ambient air penetrates into the piston suction pipe (13).

Claim 2 (amended) The vacuum holding device (1) according to Claim 1, characterized in that the valve (9) is constructed as a form selected from the group consisting of substantially conical, spherical [or] and hemispherical.

Claim 3 (amended) The vacuum holding device (1) according to claim 1 wherein the connection between the vacuum chamber (5) and the external environment has a form selected from the group consisting of conical, spherical [or] and hemispherical bearing surface (8) to accommodate the valve (9).

Claim 5 (amended) The vacuum holding device (1) according to claim 1 wherein one part of the means for producing a detachable, substantially gastight coupling from [the] an upwardly directed opening is a surface.

Claim 8 (amended) The vacuum holding device (1) according to claim 1 wherein the vacuum holding device (1) has a holding receptacle for [the] an equipment holder.

Claim 9 (amended) A method for securing a vacuum holding device (1) by means of an apparatus for producing a vacuum according to claim 1 to a contact surface (14) comprising:

- positioning the vacuum holding device (1) on a contact surface (14),
- producing a detachable, substantially gastight coupling between [an] the outwardly directed opening of the vacuum holding device (1) and [the] a piston suction pipe (13),
- producing a vacuum in [the] a vacuum chamber (5) by withdrawing [the] a suction piston (28) from the piston suction pipe (13) until the suction piston (28) passes an upper opening (26) and
- removing the apparatus for producing a vacuum.

Claim 10 (amended) A vacuum holding device (1), wherein the vacuum holding device has:

- a vacuum chamber (5) which is open in the direction of the contact surface (14),
- an opening as the end of a connection between the vacuum chamber and the external environment (7),
- a valve (9) which ensures gastight closing and opening of the connection between the vacuum chamber (5) and the external environment (7) and
- means for producing a detachable substantially gastight coupling between the outwardly directed opening and an apparatus for producing a vacuum,

- the valve (9) is constructed as a form selected from the group consisting of substantially conical, spherical or hemispherical and
- the connection between the vacuum chamber (5) and the external environment has a form selected from the group consisting of conical, spherical [or] and hemispherical bearing surface (8) to accommodate the valve (9),
[characterized in that]
- the vacuum holding device has a seal (15) which closes the vacuum chamber gastight towards the outside against the contact surface (14) and
- the valve (9) extends [downwards] as a strip or rod with a support.

Claim 11 (amended) The vacuum holding device (1) according to Claim 10,
[characterized that] wherein at the end of the strip or rod there is at least one support[, preferably] in the form of at least one member of the group consisting of one pin [or] and wedge.

Claim 12 (amended) The vacuum holding device (1) according to claim 10
wherein the [strip or rod-shaped] extension of the valve (9) is elastic [in order] to hold the valve in the bearing surface.